California Architect Proficiency Survey

Executive Summary

California Architects Board
public protection through examination, licensure, and regulation

Published by California Architects Board, March 2002
Photography by Betsy Figueira

TABLE OF CONTENTS

INTRODUCTION

Throughout 2000, the California Architects Board (CAB) conducted a comprehensive investigation of the post-licensure competency of architects in California. A key element of CAB's investigation was a statewide survey on this topic. CAB's Task Force on Post-Licensure Competency oversaw the development of the survey with the assistance of a private consulting firm that specializes in large-scale research surveys.

PURPOSE

The California Architect Proficiency Survey was created for the primary purpose of obtaining data from stakeholder groups in order to define levels of architects' proficiency, to identify where there may be weaknesses, and to identify their probable causes and possible solutions.

PROCESS

The survey was sent to 5,625 individuals, including California licensed architects; allied design professionals (engineers and landscape architects); California general building contractors; regulators (building officials, plan checkers, and planners); end-users (clients and developers); and forensic, insurance, and legal professionals. Completed surveys were returned by 1,103 respondents, or 19.6% of the survey sample. Numerous scientific analyses were conducted on the data to determine that the respondent group was representative of the survey population and that the data were reliable.

CONCLUSIONS

Based on the results of the survey and the recommendations of the Task Force on Post-Licensure Competency, the California Architects Board has concluded that:

1. Overall, California architects do not have serious or significant post-licensure competency problems.
2. At the present time, a broad-based mandatory continuing education program is not warranted.
3. The Board will continue to review the need for targeted action to correct or improve identified areas of potential competency problems as they relate to public health, safety, and welfare.

STUDY BACKGROUND AND PURPOSE

In fall 1998, CAB conducted five customer focus group meetings to gather broad-based input for the annual update of the Board's Strategic Plan. CAB published the *Focus Group Meetings Report,* which summarizes the results of the meetings. During the focus group meetings, some questions were raised about the post-licensure competency of architects. As a result, the Board created the Task Force on Post-Licensure Competency to study this issue, to consider CAB's role in ensuring licensees' continued competency, and to investigate possible solutions (including the possibility of mandatory continuing education for all California-licensed architects).

The Task Force reviewed the data from the focus group meetings, as well as a large amount of information compiled by Board staff relative to a variety of continuing education programs. These included programs within the California Department of Consumer Affairs, programs being utilized by architectural licensing boards in other states, and the continuing education program of The American Institute of Architects (AIA). The Task Force review also included articles on continuing education programs and analyses of their effectiveness in improving the performance of licensed practitioners.

As part of its continuing evaluation, the Task Force on Post-Licensure Competency recommended that CAB release a Request for Proposal (RFP) for an independent statewide scientific study on the question of post-licensure competency and professional development of California architects. The primary purpose of the research was to provide CAB with valid and reliable data upon which to make future policy decisions about these issues. The RFP was released in January 2000, and Professional Management and Evaluation Services, Inc. (PMES) was awarded the contract in March 2000 to conduct the research. This report summarizes the results of this research.

To achieve CAB's research goals, PMES designed and conducted two research studies. The first, the post-licensure competency study, was conducted on samples of architects and non-architects. It investigated the nature and extent of

potential post-licensure competency issues for California licensed architects, and then established the relationship of these issues to CAB's purview, including protection of the public health, safety, and welfare.

The second, the professional development study, was to investigate current professional development programs for architects. It was conducted solely with architect respondents and measured current participation in the different professional development programs available.

The reader should note that this report is a non-technical summary of the final results from CAB's California Architect Proficiency Survey. The report describes briefly the research and operational activities PMES conducted and provides an overview of the study's major findings and conclusions. A full account of the study's methods, findings, and conclusions is presented in the technical report, *Post-Licensure Competency and Professional Development: Results from the CAB Post-Licensure Competency Study*. Readers interested in a more detailed, technical presentation of the study's methods, data, and findings of the data analyses should refer to the technical report.

The following sequence of research activities of the study is presented in this report:

- development of the survey instrument
- definition of the survey sample populations and sample framework
- survey distribution and retrieval procedures
- determination of response rates and sample's characteristics
- implementation of statistical and qualitative studies of the survey response data
- determination of results of the studies of the survey response data
- development of conclusions and recommendations

RESEARCH PLAN

The Task Force on Post-Licensure Competency held an initial planning meeting in March 2000 to finalize the research design and the timeline for the study.

A key consideration that influenced PMES' research design was the fact that architects interface with many different groups of non-architects as they conduct their professional practice. These groups are referred to as "stakeholder groups" in this report. The Task Force confirmed that the following stakeholder groups were to be included in the study:

- California licensed architects
- Regulators – building officials, plan checkers, code reviewers, and planners
- California general building contractors
- End-users – clients and developers
- Forensic, insurance, and legal professionals
- Allied design professionals – engineers and landscape architects

PMES' research plan incorporated the post-licensure competency study and the professional development study into a single survey questionnaire that was administered to a random, stratified representative sample from each of the six stakeholder groups. This enabled the collection of systematic data on each respondent's experience and opinion on the post-licensure competency issues.

Implementation of the research plan involved the phases illustrated below. The first phase involved preparing for the research and required studying materials from documentary sources to understand the nature and scope of the post-licensure competency issues previously identified. The remaining phases are described in the following sections of this report.

Research Phases

Background research using CAB's documentary materials	Stakeholder focus group meeting to develop framework for survey questionnaire	Development of survey questionnaire and sampling design	Survey of representative samples from stakeholder groups	Data analysis to identify major research findings	Development of policy implications for CAB's future management of post - licensure competency

QUESTIONNAIRE DEVELOPMENT

A valid study of post-licensure competency requires enumerating all of the tasks typically carried out by California licensed architects. To ensure an exhaustive survey of these tasks, PMES referenced the task list from the 1997 Job Analysis Survey, previously conducted by PMES for CAB, as a stimulus for developing the conceptual framework for the post-licensure competency study.

Twenty-four participants representing the different stakeholder groups were invited to the Survey Framework Committee meeting in April 2000. The Committee developed the following conceptual framework for the California Architect Proficiency Survey:

I. Organizational
   - A. Communication
   - B. Coordination/Management
   - C. Leadership

II. Technical
   - D. Professional Growth
   - E. Responsible Practice
   - F. Vision/Awareness

In May 2000, PMES staff conducted a two-day meeting with eight Survey Development Committee members, primarily

architects[1], in attendance. The Committee consolidated the draft framework into three major categories, Professional Responsibilities, Communication, and Leadership, and also drafted 32 proficiency statements. Each proficiency statement included an architect action and the intended outcomes of that action.

PILOT TEST

PMES pilot tested the draft survey questionnaire with representatives sampled from each of the six stakeholder groups.

The pilot test respondents were asked to:

- Review the proficiency statements for content organization, terminology clarity, completeness, and appropriateness.
- Identify any problems with the terminology and instructions, especially with respect to the definitions and response options in the rating scales.
- Identify any problems with the biographical or professional development questions.

The results of the analysis of the pilot test data confirmed that the survey instrument appeared to be viable and that the rating scales, while in need of minor improvements, functioned well as measurement tools.

DEVELOPMENT OF THE FINAL QUESTIONNAIRE

In light of the successful pilot test results, the Survey Development Committee made minor modifications in each section of the survey questionnaire.

[1] The architects represented large and small firms, forensic practice, corporations, Northern and Southern California, and the educational arena of architecture.

The California Architect Proficiency Survey questionnaire contained three main sections:

- Section 1 – Biographical Information (nine questions)
- Section 2 – Performance of Architectural Services (32 task statements organized under three major categories)
- Section 3 – Professional Development (10 questions)

Each of these three sections included a space for respondent comments about that section. Additionally, Section 4 – Comments provided space in which respondents could record any comments they had about any material in the questionnaire.

In Section 2 – Performance of Architectural Services, respondents rated the task statements based on three rating scales: Architect Proficiency, Causes of Proficiency Concerns, and Potential Solutions. All task statements were rated using a 5-point Proficiency Scale for the level of architects' overall performance of the stated task: 5-Highly Proficient, 4-Proficient, 3-Mostly Proficient, 2-Less Than Proficient, and 1-Not Proficient. However, only those tasks that were rated as being "less than proficient" or "not proficient" were rated using the Causes and Solutions scales. A more detailed definition of the rating scales is listed on page 15.

DATA COLLECTION

SAMPLING

The survey's sample design required establishing selection criteria and a sampling mechanism that would generate a representative sample of respondents from each of the six stakeholder groups. In order to ensure an adequately sized sample of usable survey returns, the total survey sample was set at 5,625 respondents. This number was considered sufficient to provide adequate case counts for statistical analysis when broken out by stakeholder subgroups.

PMES' sample design specified a weighted random sample of 2,500 (44.4%) California licensed architects and 3,125 (55.6%) non-architects. The non-architects were to be equally divided among the other five stakeholder groups (625 cases–11.1% each). For each of these groups, an initial random sample, proportionally stratified by California county, was selected. This initial sample was modified to boost representation from the smallest counties by redistributing cases, at random, from the most heavily represented largest counties, such as Los Angeles, San Diego, and San Francisco.

These procedures resulted in the selection of a sample that was broadly representative of the geographic distribution of the survey population, both by California county and by Northern/ Southern California division.

The breakdown of the final sample of 5,625 cases by stakeholder group is as follows: 2,500 architect cases (44.4%); 1,046 allied design professional cases (18.6%)[2]; 625 cases each (11.1%) for regulators, contractors, and end-users; and 204 forensic cases (3.6%).

DISTRIBUTION AND RETRIEVAL OF QUESTIONNAIRES

In October 2000, survey packets containing a questionnaire, cover letter, and return envelope (postage paid) were mailed to the 5,625 respondents in the sample. Respondents were given two weeks to complete and return the questionnaire, and a reminder postcard was mailed to all respondents one week after the initial mail out date.

A tracking label was affixed to each survey for the purpose of monitoring the returned surveys (using a computerized tracking

[2] As there were only 204 cases in the forensic/insurance/legal professionals' database, an extra 421 cases were reassigned to the allied design professionals sample, comprised of eight professions who work closely with architects, bringing the total sample size for this group to 1,046 cases.

system) for sample bias and geographic representativeness. PMES monitored the returns and provided regular status reports to CAB on survey returns.

The questionnaires were scanned and a computer data file was created. The data were then cleaned, verified, and up-loaded into a database for statistical analysis. PMES research staff reviewed the data to ensure that there was adequate statistical variability and an absence of bias.

SAMPLE RETURNS

Of the 5,625 surveys mailed, 5.4% of the questionnaires were undeliverable. The overall response rate was 28.3% from the whole sample, slightly lower than the 34.8% response rate to the 1997 CAB Job Analysis Survey. When examined by stakeholder group, architects were the most responsive with a return rate of 38.0%, and end-users were least responsive with a return rate of 9.9%.

To be eligible for participation in the study, a respondent had to be a resident in the state of California, be a member of his or her assigned stakeholder group, and have at least some professional involvement with the work of architects within the last three years. Almost a third of those who returned the survey did not meet one or more of these requirements and had to be excluded from the study. This meant that the usable sample was reduced to 1,103 respondents, or 19.6% of the final sample.

Table 1 presents information on the number of usable questionnaires by stakeholder group.

Table 1
Final Usable Sample by Stakeholder Group

Stakeholder Group	Usable Sample	
	Number	Percentage
Architects	765	69.4
Regulators	97	8.8
Contractors	29	2.6
End-Users	35	3.2
Forensic	28	2.5
Allied Design	149	13.5
Total	1,103	100.0

Broken out by stakeholder group, 69.4% of the usable cases were architects and 30.6% were non-architects. It should be noted that three stakeholder groups, end-users, contractors, and forensic, are noticeably under-represented in the usable sample. The low case counts in these stakeholder groups made it necessary to combine cases across all five stakeholder groups to achieve statistical adequacy for the statistical analyses summarized below. While results are presented by individual stakeholder group for the proficiency scale ratings, caution should be exercised in interpreting these data and drawing conclusions about the response patterns for the smaller stakeholder group samples.

Unless indicated otherwise, the results reported below are based on an analysis of the 1,103 respondents in the usable sample.

SAMPLE REPRESENTATIVENESS

A comparison of the total population, selected sample, and usable sample by California county showed that, generally, there appeared to be adequate representation in the usable data across California; only one county, Alpine County, is not represented at all. Similarly, the results showed adequate representation when the California counties were aggregated

and divided into north and south regions of California. And although the results of the sampling by professional experience show some under-sampling for younger respondents (less than or equal to 10 years of professional experience) and some over-sampling for older respondents (21 to 30 years of professional experience), it is unlikely that such sampling error would have greatly affected the study's major findings.

Overall, despite the low response rate, the sampling strategy appears to have functioned effectively and has produced a close match between the characteristics of the survey population, the selected sample, and the usable sample on the two stratifying variables (geographic region and professional experience).

SURVEY RESULTS

SAMPLE CHARACTERISTICS

Table 2 presents data on the whole sample for a number of selected biographical and work-related characteristics. As expected from the sample's composition, a majority of the sample are practicing architects. Of the remainder, most either work with or review the work of architects, while less than one in ten manage or retain the services of architects. Only a few report having little contact with architects.

While a majority of the sample hold either a 5-year degree in architecture or a graduate degree, most of the remainder hold a 4-year undergraduate degree in architecture or another field. And while most have between 11-30 years of work experience, one-fifth have less than 10 years, and a little over one-tenth have more than 30 years of work experience. Three-quarters of the sample work 35-50 hours per week; only a few work less than 20 hours a week. While three-quarters work in a professional office, the rest work in a federal/state/county or municipal agency or a private corporation. And while more than half of the sample work in a small office with 1-10 employees, more than approximately one in six work in large offices with more than 50 employees.

In terms of construction type, single-family, general commercial, and mixed building types account for the majority of the sample's building work. Most of the sample is engaged in new construction work or a mixture of new/remodel-renovation. Finally, while a majority report that most of their building projects are located in two or more California counties, most of the rest work on projects within a single California county.

Table 2

Sample's Characteristics by Selected Variables

Involvement in Architect's Work

	Practicing Architect	*Retain/ Manage*	*Work With*
%	62.0	7.3	15.1

	Reviews Work of	*Little Contact*	*TOTAL**
%	13.4	2.2	100.0%

Highest Level of Formal Education

	< 4 yr. Degree	*4 yr. Degree Other*	*4 yr. Degree Architecture*
%	10.4	15.3	15.2

	5 yr. Degree Architecture	*Graduate Degree*	*Other Education*	*TOTAL**
%	31.2	24.2	3.7	100.0%

Work Experience

	0-5 yrs.	*6-10 yrs.*	*11-20 yrs.*
%	7.6	12.9	37.6

	21-30 yrs.	*> 30 yrs.*	*TOTAL**
%	28.2	13.7	100.0%

Hours Worked per Week

	1-19 Hours	*20-34 Hours*	*35-40 Hours*
%	3.5	5.1	34.1

	41-50 Hours	*> 50 Hours*	*TOTAL**
%	43.3	14.0	100.0%

Primary Work Setting

	Professional Office	*Corporation*	*Federal/State/ County*
%	73.6	4.9	5.7

	Municipal	*Education*	*Other*	*TOTAL**
%	9.1	2.1	4.6	100.0%

Full-Time Employees

	1	*2-10*	*11-25*
%	22.1	33.8	17.0

	26-50	*> 50*	*TOTAL**
%	11.4	15.7	100.0%

Predominant Building Type

	Single Family Residential	*Multi-Unit Residential*	*General Commercial*
%	24.4	3.8	21.7

	Essential Services	*Mixed Types*	*Other*	*TOTAL**
%	15.5	26.1	8.5	100.0%

Predominant Construction Type

	New	*Remodeled/ Renovated*	*Mixed*	*TOTAL**
%	43.6	25.6	30.8	100.0%

Location of Most Projects

	1 CA County	*> 1 CA County*	*Outside California*
%	40.1	56.1	3.7

	Outside US	*TOTAL**
%	0.1	100.0%

** Number counts for Totals range from 1,027 to 1,103*

POST-LICENSURE COMPETENCY STUDY

ANALYSIS STRATEGY

In this study, PMES treated the question of whether a post-licensure competency problem exists among California architects as a hypothesis. To investigate the nature of California architects' post-licensure proficiency, and to test the hypothesis of a competency problem, the following statistical analyses were conducted:

Descriptive Analysis: Single variable statistics (frequencies, means, standard deviations, minimum-maximum values, etc.) were computed for each variable in the survey questionnaire.

Bi-Variate Analysis: Bi-variate statistical analyses (cross-tabulating or correlating two variables at a time) were conducted in an initial investigation to examine the patterns of relationships among variables.

Multi-Variate Analysis: Multi-variate statistical procedures (cross-tabulating or correlating more than two variables at a time) were used to investigate deeper, more complex relationships among variables.

Qualitative Analysis: Qualitative analysis of respondents' handwritten comments was conducted to identify the major themes of their content. A special effort was made to identify and tabulate two kinds of comments in particular: comments that were classified as contradicting the findings of the quantitative analysis; and comments that were classified as supporting or corroborating the quantitative results.

PROFICIENCY SCALE RESULTS

Respondents were asked to rate 32 task statements on three scales: the Proficiency Rating Scale, the Causes of Proficiency Concerns Rating Scale, and the Potential Solutions Rating Scale. The Proficiency Rating Scale is by far the most important scale, in that it measures both the scope (how many tasks are involved) and the magnitude (degree of architects' proficiency) of a potential post-licensure problem in architectural practice in California.

The Proficiency Rating Scale has six response options (including No Opinion), as shown below. PMES confirmed that the distribution of responses for each task indicated that respondents used all six response options in their ratings.

1 - Architects are Not Proficient

Architects are *not proficient* at this task, resulting in serious problems that could have major cost, schedule, or functional impacts, OR public safety impacts.

2 - Architects are Less Than Proficient

Architects are *less than proficient* at this task, resulting in significant problems that could have moderate cost, schedule, or functional impacts.

3 - Architects are Mostly Proficient

Architects are *mostly proficient* at this task, resulting in occasional deficiencies that could have minor cost, schedule, or functional impacts.

4 - Architects are Proficient

Architects are *proficient* at this task, resulting in only occasional or minor problems that, although irritating, do not have consequential cost, schedule, or functional impacts.

5 - Architects are Highly Proficient

Architects are *highly proficient* at this task.

N - No Opinion

PMES used a rating of 1-Not Proficient or 2-Less Than Proficient as an indicator of a potential problem in architectural competence. A rating of 3-Mostly Proficient was used as evidence of a minimally acceptable level of proficiency. Thus, **only if** respondents rated a 1 or a 2 on the Proficiency Rating Scale were they instructed to go on and complete the ratings of the tasks on the Causes of Proficiency Concerns and Potential Solutions scales.

The results in terms of mean (average) proficiency ratings for each task for the whole sample are presented in Table 3. Table 4 presents the mean proficiency ratings for the whole sample and by stakeholder group for all 32 tasks and for the set of tasks in each category of practice.

Overall, PMES found that there is little evidence of a post-licensure competency problem for licensed architects in California. This can be seen in the mean value of 3.46 for all 32 tasks for the whole sample, which is almost mid-way between the Mostly Proficient (3.00) and Proficient (4.00) categories of the scale. While the mean value for all 32 tasks is higher (3.58), as might be expected, for architects and lower (3.18) for the non-architect stakeholder groups, it is still notably above the value of 3.00, which defines Mostly Proficient.

This same pattern of results is evident when the tasks are grouped into their three practice area categories: Architectural Practice Responsibilities (tasks identified by "R"), Communication (tasks identified by "C"), and Leadership (tasks identified by "L"). For all three sample groupings (whole sample, architects, and non-architects), the mean values for the tasks in each of the practice area categories is above the value of 3.00-Mostly Proficient. And while the values for architects are consistently higher than those for non-architects, the values for the latter are still well above 3.00-Mostly Proficient. Even when the tasks with the lowest mean values are examined, only two tasks (R4 and R18) have mean ratings lower than 3.00 for the non-architects. On the other hand, task R20 receives the highest rating for both architects and non-architects.

A review of mean proficiency ratings by the five individual non-architect stakeholder groups (Table 4) reveals that, both overall and by practice area category, the end-users gave architects the highest ratings, while the contractors gave the lowest ratings.[3] Between these two extremes, the ratings of allied design professionals, regulators, and forensic were more closely grouped and consistently above a rating of 3.00-Mostly Proficient, both overall and by practice area category. However, what PMES found notable is that only one individual task (R11) was rated below a value of 2.50 by any stakeholder group. In short, PMES concluded that the results by stakeholder groups show **little evidence** of the perception of a post-licensure problem in architectural practice in California.

Before accepting these results as valid and rejecting the hypothesis of a post-licensure competency problem, there were two additional possible explanations that needed to be ruled out. The first, given the low response rates to the survey mail-out, was the possibility of sampling error. Perhaps a different sample of respondents would have produced a pattern of ratings consistent with the hypothesis. The second possibility was that there may be factors associated with stakeholder group affiliation that mask the evidence of a competency problem. PMES investigated each of these possibilities by conducting a split-half sample reliability analysis, and contingency tabular analysis, respectively.

[3] The full technical report explains the impact of sampling error, measured by the standard error coefficient, and gives the range of the likely "true" mean values for stakeholder groups.

Table 3

Proficiency Scale Mean Rating by Task and by Practice Area Category for Whole Sample

Practice Area Category: ARCHITECTURAL PRACTICE RESPONSIBILITIES (R)

Tasks		Mean*
R1	Defines the scope of services including adequately establishing project milestones, resource allocation, budget, and schedule.	3.48
R2	Obtains and distributes the following project information in a timely manner to avoid redesign, additional costs, and time delays: site information (site survey, soils survey, geological, environmental); regulatory information (applicable laws, codes, regulations); existing building conditions; budget; schedule.	3.51
R3	Involves appropriate project team members in a timely manner to keep the project on schedule and within budget.	3.57
R4	Coordinates work product of each consultant with other consultants' work products to avoid conflicts in documentation and additional costs and time delays.	3.24
R5	Coordinates and submits adequate documentation to receive regulatory approval.	3.65
R6	Submits documentation in a timely manner to receive regulatory approval.	3.60
R7	Establishes and assures project team's adherence to common standards (e.g., graphic symbols, application software, specification content and format) to ensure quality documentation.	3.51
R8	Demonstrates understanding of the intent and appropriate application of current laws, codes, regulations, and other requirements to ensure consistency of compliance in the documents and minimize delays due to plan check comments.	3.52
R9	Demonstrates recognition of potential conflicts between laws, codes, regulations, and other requirements to avoid increased costs and time delays for revising noncompliant work.	3.33

R10 Ensures that contracts, drawings, details, and specifications are appropriate for selected delivery system (e.g., design-build, design-bid-build, negotiated bid) to reduce unnecessary or redundant documentation and hence achieve a more accurate schedule and cost estimate.	3.40
R11 Adequately researches and verifies existing building conditions and understands their impact on the project to avoid negative impacts on cost, schedule and quality.	3.37
R12 Prepares drawings, details, and specifications that demonstrate understanding of appropriate construction techniques, means, and methods to ensure project's ability to be constructed.	3.65
R13 Demonstrates a comprehensive understanding of building systems to effectively coordinate with allied professionals to produce adequate drawings, details, and specifications.	3.55
R14 Demonstrates understanding of the impact of architectural design on selection, integration, and operation of building systems to eliminate conflicts between systems (e.g., building envelope, waterproofing, sound control, fireproofing, structural, mechanical, electrical, plumbing).	3.39
R15 Demonstrates understanding of the impact of architectural design on costs, including construction, operation, and maintenance of the building systems.	3.22
R16 Properly integrates the building sub-systems (e.g., furnishings, fixtures, equipment) into project to avoid negative impacts on cost and schedule.	3.38
R17 Recommends appropriate building materials consistent with project objectives including budget and schedule.	3.68
R18 Conducts appropriate review and check of documents to avoid design conflicts, schedule delays, and increased costs.	3.15
R19 Researches codes, scope of work, construction process, documentation, etc., so that there is adequate information to complete the project within schedule and budget.	3.42

R20	Creates design that, overall, considers human comfort, usability of building, and component impact (e.g., on noise, temperature, air quality, views, lighting, materials and textures) to ensure building functions in accordance with client expectations and program requirements.	3.82
R21	Uses appropriate observation procedures during site visits to identify potential construction problems and avoid added cost and time.	3.38
R22	Distributes, monitors, coordinates, and takes appropriate and timely action on construction phase submittals to keep the project on schedule, within budget, and in conformance with the contract documents.	3.50

** Standard Deviation (SD) range: 0.83-0.99*

Practice Area Category: COMMUNICATION (C)

Tasks		Mean**
C1	Clarifies project feasibility issues with client to ensure project fits within client's schedule and budget.	3.48
C2	Documents decisions reached with client to clarify scope of services for the project.	3.55
C3	Documents program decisions and communicates them to client to ensure appropriate management of client's expectations for the project.	3.50
C4	Clearly communicates (orally, graphically, and/or in writing) technical instructions, design decisions, and changes to consultants in a timely manner to minimize errors and to meet schedule.	3.47
C5	Communicates to consultants in clear and appropriate detail to ensure that these allied professionals understand their contractual requirements to adequately define consultant services for the agreed upon fee.	3.46

C6	Facilitates internal communications to ensure clear, consistent instructions to the project team (e.g., a single voice to avoid major problems from dissemination of misinformation).	3.49
C7	Prepares adequate, timely construction administration documents (e.g., submittal review, field reports, etc.) and provides them to the project team members to allow their timely response and to maintain budget, schedule, and quality.	3.46

*** Standard Deviation (SD) range: 0.85-0.89*

Practice Area Category: LEADERSHIP (L)

Tasks		Mean***
L1	Focuses the efforts of the project team to achieve the client's objectives and requirements and to ensure a successful outcome (e.g., a buildable product).	3.69
L2	Establishes and sustains the central role of the architect in the total building process to cause the project to be completed to best achieve client goals.	3.53
L3	Motivates the project team to identify creative design solutions that respond to community/societal expectations.	3.49

**** Standard Deviation (SD) range: 0.87-0.99*

Table 4

Proficiency Scale Mean Ratings by Practice Area Category by Stakeholder Group

Sample Group	Mean Proficiency Rating*			
	All Categories 32 tasks	**Architect Resp.** 22 Tasks	**Commu-nication** 7 Tasks	**Leader-ship** 3 Tasks
Whole Sample (≤ 1083)	3.46	3.45	3.46	3.56
Architects (≤ 750)	3.58	3.57	3.57	3.68
Non-Architects (≤ 333)	3.18	3.17	3.17	3.23
Regulators (≤ 94)	3.15	3.14	3.21	3.20
Contractors (≤ 29)	2.95	2.96	2.89	2.92
End-Users (≤ 35)	3.45	3.44	3.47	3.45
Forensic (≤ 27)	3.14	3.14	3.12	3.36
Allied Design (≤ 148)	3.18	3.18	3.14	3.23

* *Range of SD (Standard Deviation) is 0.55 – 0.91.*

Range of Standard Error (measure of sampling error) is 0.019 – 0.184.

SPLIT-HALF SAMPLE RELIABILITY ANALYSIS

While the possibility of sampling error is always an issue for research, except in the case of extremely large samples, in this case it was imperative to consider because of the low response rate to the survey mail-out. In other words, the lack of evidence pointing to a competency problem may have been due to the fact that most of the subjects in the selected sample did not respond to the survey.

Mailing out the survey again to a different sample of subjects drawn from the survey population was not feasible given the costs involved. However, using a standard statistical procedure called a "split-half" sample reliability analysis, it is possible to evaluate the reliability or generalizability of quantitative results from an empirical study. This analysis involves randomly dividing the usable sample into two halves, repeating the statistical analysis on one half-sample, and comparing these results with the original results for the whole sample. Random assignment of cases into two groupings is equivalent, statistically, to repeating the study on an independent sample.

A split-half sample reliability analysis was conducted on the proficiency scale ratings for the whole sample, architects and non-architects, and on each of the non-architect stakeholder groups.

Overall, PMES found that the results – the mean proficiency scale value across all tasks, the pattern of mean values over all tasks and by practice area category, and the pattern of mean values by stakeholder group – were remarkably stable and consistent with those of the original analysis using whole sample groupings. PMES found that the pattern of results for the split-half samples when compared to original values for the non-architect stakeholder groups did not change.

PMES concluded that the results of the split-half sample reliability analysis **strongly corroborate** the results for the whole sample groupings. This suggests that repeating the study on another independent sample would produce virtually the same results, both for the whole sample and also for each stakeholder group.

CONTINGENCY TABULAR ANALYSIS

A plausible explanation for the lack of support for the hypothesis of a competency problem is that there are undiscovered relationships among the variables that mask evidence of a competency problem. Determining whether such contingent effects are involved requires breaking the proficiency data out by other factors, such as professional background or degree of professional experience. With the data divided out by categories on these factors, it is possible to determine if there is an intervening relationship present that otherwise hides or cancels out evidence of a competency problem. It should be noted, however, that only the variables measured in this study can be investigated for such effects. In other words, this analysis cannot rule out the possibility of contingent affects from other factors that were not measured in the survey.

Using virtually all available variables in Section 1 of the questionnaire (involvement with architects' work, level of formal education, work experience, hours worked per week, primary work setting, number of full-time employees, building type, construction type, location of primary workplace, and location of work projects), an exhaustive contingency table analysis was conducted. The results showed a strong, consistent pattern, in that mean values for nearly all proficiency ratings were at least 3.00-Mostly Proficient or higher across all ten variables analyzed.

While there were some interesting patterns above a rating of 3.00-Mostly Proficient, that became evident when the proficiency ratings were broken out by the biographical variables, such patterns did not change the primary result of this analysis: namely, that there was **no** additional evidence, on the basis of the 10 variables analyzed, that would change the results of the original analysis. In other words, the finding of the **lack** of supporting evidence for a competency problem among California architects appears to PMES to be valid and scientifically sound; it is most unlikely to be false.

COMPARING ARCHITECT AND NON-ARCHITECT PROFICIENCY RATINGS

One remaining question on the issue of post-licensure competency of California architects concerns the degree to which there is significant variation in the perception of architect competency on the basis of stakeholder group affiliation. That is to say, is there evidence that the more favorable view that architects hold of their proficiency is distinctly different than the view of architect proficiency held by the other stakeholder groups?

To investigate this question, three different analyses were conducted. The first analysis involved comparing the rank order of the architects' task ratings with the rank order for non-architects, and also with those for each individual stakeholder group. The second analysis involved the use of paired-comparisons to examine the degree of difference in proficiency ratings between architects and non-architects, and between architects and each stakeholder group. The third analysis was more complex and involved the use of multi-variate analysis techniques to determine whether architects and non-architects could be separated, statistically, on the basis of differences in their proficiency ratings.

RANK ORDER ANALYSIS

Table 5 presents the mean proficiency ratings for all 32 tasks in descending order for the whole sample and also shows the numeric rank order for architects and non-architects.

Overall, the results of the rank order analysis show that there was a good degree of agreement between architects and non-architects about the relative rating of tasks. This suggests concurrence between architects and non-architects, generally, about which tasks architects perform well and for which tasks there is room for improvement.

Table 5

Proficiency Scale Mean Rating by Task by Descending Order for Whole Sample, Showing Rank Order for Architects and Non-Architects

Rank Order			Tasks		Mean*
Whole Sample	Arch	Non-Arch			
1	1	1	R20	Creates design that, overall, considers human comfort, usability of building, and component impact (e.g., on noise, temperature, air quality, views, lighting, materials and textures) to ensure building functions in accordance with client expectations and program requirements.	3.82
2	2	5	L1	Focuses the efforts of the project team to achieve the client's objectives and requirements and to ensure a successful outcome (e.g., a buildable product).	3.69
3	5	2	R17	Recommends appropriate building materials consistent with project objectives including budget and schedule.	3.68
4	4	3	R12	Prepares drawings, details, and specifications that demonstrate understanding of appropriate construction techniques, means, and methods to ensure project's ability to be constructed.	3.65
5	3	7	R5	Coordinates and submits adequate documentation to receive regulatory approval.	3.65
6	6	6	R6	Submits documentation in a timely manner to receive regulatory approval.	3.60

7	7	18	R3	Involves appropriate project team members in a timely manner to keep the project on schedule and within budget.	3.57
8	8	10	R13	Demonstrates a comprehensive understanding of building systems to effectively coordinate with allied professionals to produce adequate drawings, details, and specifications.	3.55
9	14	4	C2	Documents decisions reached with client to clarify scope of services for the project.	3.55
10	11	9	L2	Establishes and sustains the central role of the architect in the total building process to cause the project to be completed to best achieve client goals.	3.53
11	10	15	R8	Demonstrates understanding of the intent and appropriate application of current laws, codes, regulations, and other requirements to ensure consistency of compliance in the documents and minimize delays due to plan check comments.	3.52
12	9	25	R2	Obtains and distributes the following project information in a timely manner to avoid redesign, additional costs, and time delays: site information (site survey, soils survey, geological, environmental); regulatory information (applicable laws, codes, regulations); existing building conditions; budget; schedule.	3.51

Rank Order			Tasks		Mean*
Whole Sample	Arch	Non-Arch			
13	16	11	R7	Establishes and assures project team's adherence to common standards (e.g., graphic symbols, application software, specification content and format) to ensure quality documentation.	3.51
14	18	12	C3	Documents program decisions and communicates them to client to ensure appropriate management of client's expectations for the project.	3.50
15	13	21	R22	Distributes, monitors, coordinates, and takes appropriate and timely action on construction phase submittals to keep the project on schedule, within budget, and in conformance with the contract documents.	3.50
16	17	17	C6	Facilitates internal communications to ensure clear, consistent instructions to the project team (e.g., a single voice to avoid major problems from dissemination of misinformation).	3.49
17	15	24	L3	Motivates the project team to identify creative design solutions that respond to community/societal expectations.	3.49
18	20	14	C1	Clarifies project feasibility issues with client to ensure project fits within client's schedule and budget.	3.48

19	22	8	R1	Defines the scope of services including adequately establishing project milestones, resource allocation, budget, and schedule.	3.48
20	12	27	C4	Clearly communicates (orally, graphically, and/or in writing) technical instructions, design decisions, and changes to consultants in a timely manner to minimize errors and to meet schedule.	3.47
21	21	19	C5	Communicates to consultants in clear and appropriate detail to ensure that these allied professionals understand their contractual requirements to adequately define consultant services for the agreed upon fee.	3.46
22	19	20	C7	Prepares adequate, timely construction administration documents (e.g., submittal review, field reports, etc.) and provides them to the project team members to allow their timely response and to maintain budget, schedule, and quality.	3.46
23	23	29	R19	Researches codes, scope of work, construction process, documentation, etc., so that there is adequate information to complete the project within schedule and budget.	3.42
24	27	16	R10	Ensures that contracts, drawings, details, and specifications are appropriate for selected delivery system (e.g., design-build, design-bid-build, negotiated bid) to reduce unnecessary or redundant documentation and hence achieve a more accurate schedule and cost estimate.	3.40

Rank Order			Tasks		Mean*
Whole Sample	Arch	Non-Arch			
25	25	23	R14	Demonstrates understanding of the impact of architectural design on selection, integration, and operation of building systems to eliminate conflicts between systems (e.g., building envelope, waterproofing, sound control, fireproofing, structural, mechanical, electrical, plumbing).	3.39
26	28	13	R16	Properly integrates the building sub-systems (e.g., furnishings, fixtures, equipment) into project to avoid negative impacts on cost and schedule.	3.38
27	26	28	R21	Uses appropriate observation procedures during site visits to identify potential construction problems and avoid added cost and time.	3.38
28	24	30	R11	Adequately researches and verifies existing building conditions and understands their impact on the project to avoid negative impacts on cost, schedule and quality.	3.37
29	29	22	R9	Demonstrates recognition of potential conflicts between laws, codes, regulations, and other requirements to avoid increased costs and time delays for revising noncompliant work.	3.33
30	30	32	R4	Coordinates work product of each consultant with other consultants' work products to avoid conflicts in documentation and additional costs and time delays.	3.24

31	32	24	R15	Demonstrates understanding of the impact of architectural design on costs, including construction, operation, and maintenance of the building systems.	3.22
32	31	31	R18	Conducts appropriate review and check of documents to avoid design conflicts, schedule delays, and increased costs.	3.15

* *Standard Deviation (SD) ranges from 0.83 – 0.99.*

COMPARISON OF ARCHITECTS WITH EACH STAKEHOLDER GROUP

For this analysis, the architect sample was paired with each of the other non-architect stakeholder groups to produce five different paired-comparisons. A difference score was computed by subtracting each non-architect stakeholder group's mean proficiency rating from the architect's mean for all 32 tasks, and also for tasks grouped by practice area category. The strength and statistical significance of the difference between each comparison pair was then examined.

Overall, with one exception, a consistent pattern of results was observed, showing small to modest differences between the architects' ratings when aggregated over all tasks and grouped by practice area, and those of each of the other stakeholder groups. Whether these are merely *differences in degree* or whether it is more significant and represents a *difference in kind* was the question addressed by the multi-variate analysis.

MULTI-VARIATE ANALYSIS

Discriminant function analysis was used to analyze the statistical ability of the proficiency ratings, on all individual tasks, to separate the architect and non-architect samples. This analysis offers a statistical test of predictive power by

comparing the *a priori* stakeholder group membership against group classifications made by the discriminant functions.

Overall, the multi-variate discriminant function that was generated had little statistical ability to separate the architect and non-architect groupings. While it was able to classify almost all of the architects correctly, it **incorrectly** classified nearly all of the non-architects.

The results of this analysis show clearly that PMES was unable to construct a multi-variate statistical model using only the proficiency ratings that was capable of distinguishing architects from non-architects. Had the discriminant function been successful, this would have been strong evidence for a qualitative difference (a *difference in kind*) that separates architects and non-architects in their perception of architect proficiency. When taken with the results of both the rank order analysis and the paired-comparison analysis, the evidence suggests, instead, that the difference is more a *difference in degree*. In other words, architects and non-architects appear to be *more similar* than they are different in their view of California architect competency.

POTENTIAL PRACTICE AREAS FOR IMPROVING ARCHITECT PROFICIENCY

In addition to evaluating the evidence for the hypothesis of a competency problem among California architects, PMES' analysis went on to investigate the issue of whether there are aspects of practice that can be identified that may warrant an improvement in architect performance.

For this analysis, operationally, PMES identified tasks for which the mean rating by any individual stakeholder group or by non-architects was less than 3.00. A task not meeting the standard of a rating of 3.00 or above indicated that architect performance was rated as being something **less** than "mostly proficient." The results of this procedure are shown below, presenting a visual plot of these data organized by task number and practice area category.

Altogether, a total of 38 instances across the seven sample groupings analyzed were identified (flagged). Of all 32 tasks

in the post-licensure competency study, 22 tasks were flagged as having a mean rating less than 3.00 by one or more stakeholder groups. Of these 22 tasks, 13 were flagged by a single stakeholder group, five were flagged by two groups, three were flagged by three groups, and one task was flagged by four groups. While two groups, architects and end-users, had no tasks with a mean rating beneath 3.00, at the other extreme, contractors rated 19 tasks beneath this standard. Non-architects, as a combined group, had no tasks with a mean rating beneath 3.00.

As shown below, most of the flagged tasks had mean values between 2.99 - 2.75 (marked with "X"). From analysis not shown, 13 of these tasks had values within the 2.99 - 2.90 range. **All** five tasks with values less than 2.75 (2.74 - 2.5 marked with "K") were on the contractors' list alone. A single task, R11, had a mean rating less than 2.50 (marked with "✓"). Using a mean rating of less than 2.50 (i.e., less than midway between a rating of 3.00-Mostly Proficient, and a rating of 2.00-Less Than Proficient) to signal tasks that may be in need of immediate improvement in architect performance, this is the **only** task identified by this criterion.

A final point: to put these results in perspective, it is worth reporting on the data from the other end of the proficiency rating scale – that is, tasks for which architect performance was rated **better than "mostly proficient."** Using a mean rating of 3.50 or above (a 4 rating was defined as "Architects are *proficient* at this task, resulting in only occasional or minor problems that, although irritating, do not have consequential cost, schedule, or functional impacts"), it is possible to identify those practice areas in which architects have performed well.

Using this criterion, there are a total of 40 instances, altogether, across the sample groupings in which the mean rating for a given task was more than or equal to 3.50. As might be expected, architects were much more inclined to rate tasks at this level than non-architects – 24 tasks of the total 32 tasks, compared to only one task, respectively. However, when broken out by individual stakeholder group, while contractors and regulators rated few tasks at this level (zero tasks and two tasks, respectively), allied design professionals rated eight tasks, and end-users rated 15 tasks at this level.

Plot of Tasks with Mean Proficiency Rating <3.00 by Sample Group

Practice Area Category: Architectural Practice Responsibilities (R)

Tasks	Sample Group						
	Archi-tects	Non-Archi-tects	Regu-lators	Con-tractors	End-Users	Forensic	Allied Design
R1 Defines the scope of services including adequately establishing project milestones, resource allocation, budget, and schedule.				X			
R4 Coordinates work product of each consultant with other consultants' work products to avoid conflicts in documentation and additional costs and time delays.			X	K			X
R5 Coordinates and submits adequate documentation to receive regulatory approval.			X				

R6	Submits documentation in a timely manner to receive regulatory approval.			X			
R9	Demonstrates recognition of potential conflicts between laws, codes, regulations, and other requirements to avoid increased costs and time delays for revising noncompliant work.				X		
R10	Ensures that contracts, drawings, details, and specifications are appropriate for selected delivery system (e.g., design-build, design-bid-build, negotiated bid) to reduce unnecessary or redundant documentation and hence achieve a more accurate schedule and cost estimate.				X		

Tasks	Sample Group						
	Archi-tects	Non-Archi-tects	Regu-lators	Con-tractors	End-Users	Forensic	Allied Design
R11 Adequately researches and verifies existing building conditions and understands their impact on the project to avoid negative impacts on cost, schedule and quality.			X	✓			
R14 Demonstrates understanding of the impact of architectural design on selection, integration, and operation of building systems to eliminate conflicts between systems (e.g., building envelope, waterproofing, sound control, fireproofing, structural, mechanical, electrical, plumbing).				X		X	
R15 Demonstrates understanding of the impact of architectural design on costs, including construction, operation, and maintenance of the building systems.				X		X	

R16 Properly integrates the building sub-systems (e.g., furnishings, fixtures, equipment) into project to avoid negative impacts on cost and schedule.				K			
R17 Recommends appropriate building materials consistent with project objectives including budget and schedule.				X			
R18 Conducts appropriate review and check of documents to avoid design conflicts, schedule delays, and increased costs.			X	K		X	X
R19 Researches codes, scope of work, construction process, documentation, etc., so that there is adequate information to complete the project within schedule and budget.			X	X			

Tasks	Sample Group						
	Architects	Non-Architects	Regulators	Contractors	End-Users	Forensic	Allied Design
R21 Uses appropriate observation procedures during site visits to identify potential construction problems and avoid added cost and time.			X	X		X	
R22 Distributes, monitors, coordinates, and takes appropriate and timely action on construction phase submittals to keep the project on schedule, within budget, and in conformance with the contract documents.				X		X	

Practice Area Category: Communication (C)

Tasks	Sample Group						
	Architects	Non-Architects	Regulators	Contractors	End-Users	Forensic	Allied Design
C1 Clarifies project feasibility issues with client to ensure project fits within client's schedule and budget.				X			

C3 Documents program decisions and communicates them to client to ensure appropriate management of client's expectations for the project.				X			
C4 Clearly communicates (orally, graphically, and/or in writing) technical instructions, design decisions, and changes to consultants in a timely manner to minimize errors and to meet schedule.				X		X	X
C6 Facilitates internal communications to ensure clear, consistent instructions to the project team (e.g., a single voice to avoid major problems from dissemination of misinformation).				X			

C7 Prepares adequate, timely construction administration documents (e.g., submittal review, field reports, etc.) and provides them to the project team members to allow their timely response and to maintain budget, schedule, and quality.						X	

Practice Area Category: Leadership (L)

Tasks	Sample Group						
	Architects	Non-Architects	Regulators	Contractors	End-Users	Forensic	Allied Design
L2 Establishes and sustains the central role of the architect in the total building process to cause the project to be completed to best achieve client goals.				X			
L3 Motivates the project team to identify creative design solutions that respond to community/ societal expectations.				K			

Ratings Key:

X *2.99 – 2.75*

K *2.74 – 2.50*

✓ *<2.50*

ANALYSIS OF CAUSES AND SOLUTIONS

On the assumption that the Board may want to target action to achieve improved performance by California architects on tasks with mean ratings of less than 3.00, PMES conducted additional analysis to identify the respondents' understanding of the likely causes of problems and their suggestions for solutions.

This analysis was based on ratings to the Causes of Proficiency Concerns and Potential Solutions scales, and it used data from a subset of respondents. As stated earlier, only those who rated architect performance on a given task with a 1-Not Proficient or a 2-Less Than Proficient on the Proficiency Rating Scale were instructed to complete their ratings on the Causes of Proficiency Concerns and Potential Solutions scales. These two scales both have nine response options (including Do Not Know), as shown below. The results are presented in Table 6.

Causes of Proficiency Concerns Scale

0 – Do Not Know
I do not have adequate understanding of or experience with the task to identify any causes.

A – Architects
Architects appear to lack the requisite level of knowledge, skill, or ability.

B – Other Parties
Other parties involved in the design and construction industry appear to lack the requisite knowledge, skill, or ability.

C – Codes
Ambiguities and/or conflicts in applicable laws, codes, and regulations (local, state, and federal) and/or different interpretations about what they require.

D – Changes in Materials/Methods
Changes in the availability and use of building materials and construction means and methods. *Examples of these changes: use of materials with varying content, use of steel instead of wood in residential construction, building with modular components.*

E – Changes in Marketplace

On-going changes in the design and construction marketplace as a whole. *Examples of these changes: new types of energy, communications, and security systems; differing cost and availability of material, labor, and financing.*

F – Changes in Practice

On-going changes in the development and organization of architectural practice can affect the nature and scope of architectural services. *Examples of these changes: use of nontraditional project/service delivery methods, impacts of information technology.*

G – Fees/Scope

An unrealistic relationship exists between fees and scope of architectural services, in that the scope of services exceeds the fees.

H – Schedules/Scope

An unreasonable relationship exists between schedules and scope of architectural services, in that the scope of services extends beyond the schedule.

I – Intentional

Architects knowingly or intentionally fail to act in spite of having the requisite level of knowledge, skill, and ability.

Potential Solutions Scale

0 – Do Not Know

I do not know what would improve proficiency of performance.

1 – Technical Knowledge

Improve technical knowledge, skill, and ability of architects.

2 – Business Management

Improve business management knowledge, skill, and ability of architects.

3 – Other Parties' Knowledge

Improve knowledge, skill, and ability of other parties involved in the design and construction industry.

4 – Architects' Working Relations
Improve working relations among architects.

5 – Working Relations with Others
Improve working relations between architect and other parties involved in the design and construction industry.

6 – Regulatory Environment
Improve the regulatory environment aspect of architectural practice. *Examples include: involvement in code development process, participation on regulatory boards and commissions (design review, planning commission, accessibility appeals boards, etc.).*

7 – Intra-office Environment
Improve the environment within an architect's office to increase effectiveness in relation to clients and consultants.

8 – Marketplace Conditions
Improve the design and construction marketplace conditions relative to architectural practice. *Examples include: provision of expanded services, partnering.*

9 – Client Understanding
Improve client understanding with respect to architectural services and compensation.

Overall, these results present the Board with a clear view of the respondents' beliefs about the likely causes and potential solutions to address aspects of California architectural practice needing improvement. In relation to causes, architects are not only the most frequently cited cause, but are uniformly rated as a cause on every task. To address this cause with an effective solution, the respondents believe that architects need to improve their technical knowledge and also to improve their business management skills.

Table 6

Proficiency Tasks with Mean Ratings < 3.00 by Stakeholder Group and by Causes & Solutions

Task No.	Group with <3.00 Mean		Causes: 2 Highest		Solutions: 2 Highest	
			Group	*%*	*Area*	*%*
R1	Contractors	2.76	Architects	50.5	Technical Knowledge	41.3
			Others	21.1	Business Management	31.2
R4	Regulators	2.84	Architects	51.6	Technical Knowledge	41.3
	Contractors	2.68	Others	19.6	Business Management	28.9
	Allied Design	2.82				
R5	Regulators	2.85	Architects	56.0	Technical Knowledge	42.0
			Others	20.0	Business Management	28.0
R6	Regulators	2.99	Architects	47.5	Technical Knowledge	38.6
			Others	28.7	Business Management	24.8
R9	Contractors	2.96	Architects	53.1	Technical Knowledge	49.1
			Others	24.6	Business Management	24.6

R10	Contractors	2.89	Architects	42.2	Technical Knowledge	32.6
			Others	20.0	Business Management	26.7
			Codes	20.0		
R11	Regulators	2.93	Architects	43.3	Technical Knowledge	42.8
	Contractors	2.41	Others	28.3	Business Management	27.3
R14	Contractors	2.96	Architects	46.4	Technical Knowledge	43.7
	Forensic	2.85	Others	20.5	Business Management	21.2
					Other's Knowledge	21.2
R15	Contractors	2.58	Architects	50.6	Technical Knowledge	45.6
	Forensic	2.85	Others	19.7	Business Management	23.9
R16	Contractors	2.75	Architects	50.8	Technical Knowledge	44.0
			Others	25.0	Other's Knowledge	19.8
R17	Contractors	2.85	Architects	58.0	Technical Knowledge	55.1
			Others	20.3	Business Management	15.9

Task No.	Group with <3.00 Mean		Causes: 2 Highest		Solutions: 2 Highest	
			Group	*%*	*Area*	*%*
R18	Regulators	2.79	Architects	48.2	Technical Knowledge	42.7
	Contractors	2.58	Others	23.3	Business Management	21.3
	Forensic	2.79				
	Allied Design	2.94				
R19	Regulators	2.92	Architects	52.3	Technical Knowledge	46.2
	Contractors	2.93	Others	24.2	Business Management	29.6
R21	Regulators	2.95	Architects	55.0	Technical Knowledge	47.0
	Contractors	2.79	Others	192	Business Management	19.9
	Forensic	2.83				
R22	Contractors	2.96	Architects	51.5	Technical Knowledge	45.5
	Forensic	2.90	Others	23.2	Business Management	21.2
C1	Contractors	2.76	Architects	46.1	Technical Knowledge	41.7
			Others	25.2	Business Management	16.5
					Other's Knowledge	16.5

C3	Contractors	2.86	Architects	64.2	Technical Knowledge	52.6
			Others	15.8	Business Management	23.2
C4	Contractors	2.77	Architects	60.5	Technical Knowledge	43.9
	Forensic	2.92	Others	18.4	Business Management	26.3
	Allied Design	2.99				
C6	Contractors	2.88	Architects	58.3	Technical Knowledge	57.3
			Others	22.3	Business Management	18.5
C7	Forensic	2.89	Architects	58.2	Technical Knowledge	45.9
			Others	21.4	Business Management	20.4
L2	Contractors	2.92	Architects	38.2	Technical Knowledge	34.7
			Codes	21.5	Other's Knowledge	24.3
L3	Contractors	2.71	Architects	48.9	Technical Knowledge	38.9
			Others	15.3	Business Management	19.9

ANALYSIS OF RESPONDENTS' COMMENTS

PMES recorded and analyzed hand-written comments about Section 2 from 148 survey respondents. Of the commenting respondents, 62% were architects, 16% were allied design professionals, 8% were regulators, 5% were contractors, 4% were end-users, and 4% were forensic and insurance specialists.

The main finding from this qualitative analysis is that most of the comments made by respondents were non-substantive and did not appear to modify or add to the interpretation of the statistical results. Beyond this, two other findings are noteworthy. One is that a few respondents had some difficulty in completing the survey questionnaire (understanding or following the directions and using the proficiency rating scale to rate the 32 tasks). The second is that only a very small proportion of the comments, about one in eight, was negative on the question of architect proficiency. In short, the results from the qualitative analysis suggest there appears to be very little, substantively, in the qualitative data that would significantly change or call into question the results from the quantitative analysis.

MAJOR FINDINGS

The following is a summary of PMES' major findings from the post-licensure competency study:

1. Overall, there is **little evidence** of a post-licensure competency problem for licensed architects in California. This can be seen in the mean value of 3.46 for the whole sample, which is almost mid-way between the mostly proficient (3.00) and proficient (4.00) categories of the scale. Both when grouped by practice area category and when broken down by stakeholder group, the results show little evidence of a post-licensure competency problem.

2. The analysis of sampling error (both on the whole sample and by stakeholder sample) and the split-half sample reliability analysis show the major finding is strongly supported and **highly unlikely** to be the result of measurement limitations, or to change if the study was repeated on another independent sample from the sampling population.
3. The results of the contingency tabular analysis show that when the proficiency ratings are broken out by the biographical variables, there is **no** additional evidence that would change the results of the original analysis.
4. The results from the qualitative analysis of respondents' comments show there is **little** to question or modify the main finding.
5. Taking all of the above into consideration, the **hypothesis** of a post-licensure competency problem among California architects is **not** supported by the empirical data, and the finding of the **lack** of supporting evidence for the hypothesis is highly likely to be valid and scientifically reliable. This primary finding is most unlikely to be false.
6. The results from the analysis comparing architects and non-architect stakeholders on proficiency ratings show that while there is generally agreement about which tasks architects perform well and which tasks architects perform less well, there appears to be small to modest differences between architects and non-architects on the proficiency ratings when aggregated overall and grouped by practice area.
7. The results of the multi-variate discriminant function analysis of proficiency ratings show that a statistical model could not be constructed to distinguish architects from non-architects. This suggests that the difference between architects and non-architects in their view of architect proficiency is more a difference *in degree*, than in kind, and that architects and non-architects appear to be more similar than they are different in their view of California architect proficiency.

8. The results of an analysis of tasks with mean ratings of less than 3.00 found that while 22 tasks were rated by any individual stakeholder group as less than proficient, only five tasks were rated beneath 2.75. This suggests that there are only a small number of tasks in need of immediate improvement in architect performance. An analysis of tasks with mean ratings of more than or equal to 3.50 found that there are also areas of practice for which stakeholders rated architect performance better than mostly proficient.

9. The results of analysis of the causes and solutions for the 22 tasks with mean ratings less than 3.00 found that architects are not only the most frequently cited cause, but are uniformly rated as a cause on every task. Also, to address this cause with an effective solution, it was found that the respondents believe that architects need to improve their technical knowledge and also to improve their business management skills.

PROFESSIONAL DEVELOPMENT STUDY

The results reported in this section are based on data gathered exclusively from the architect stakeholder sample[4]; all other respondents (the members of the five non-architect stakeholder groups) were instructed NOT to complete the questions in questionnaire Section 4 - Professional Development. These data provide the basis for the second study PMES conducted for CAB, an investigation of current professional development in California.

[4] Of the 765 respondents in the architect sample, 742 (97.0%) answered one or more of the questions in the Professional Development section of the questionnaire.

RESEARCH QUESTIONS

PMES' investigation addressed the following CAB research objectives relative to current professional development:

1. Determine who is currently participating in professional development efforts.
2. Study the effectiveness of existing professional development programs.
3. Study the potential costs to licensees and the public.

Participation in Continuing Education

To analyze the nature of California architect participation in current professional development programs, two analyses were conducted. The first was a descriptive analysis of responses to the question that asked architects whether or not they had participated in continuing education (CE), and also their primary reason for their participation status. The second was a bi-variate analysis in which participation in CE was cross-tabulated by selected biographical variables in order to describe the characteristics of participants and non-participants.

Table 7 shows the results of the first analysis. Of the architects who responded, about three-quarters of them reported that they participated in CE, while the remaining quarter said they did not. For those who participated in CE, over a third gave their primary reason for doing so as to further professional development. Slightly fewer said it was to keep current with changes affecting professional practice or to meet AIA requirements. For those who said they did not participate in CE, almost one in three indicated as their reason that they were not a member of AIA, while just under one-quarter indicated "other."

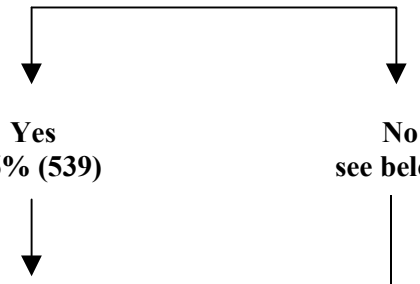
The results of the second analysis showed few architect characteristics that distinguish participants in CE from non-participants. In terms of education, two categories have a small association with participation in CE: architects with a 4-year degree in a field other than architecture are more likely to participate than are those with a 5-year degree in architecture. Also, architects who work part-time (i.e., 1-34 hours per week) are less likely to participate than their colleagues who work full-time or more. And architects who work alone are somewhat less likely to participate than their colleagues who work with other colleagues in small (2-25 employees) or larger (more than 25 employees) firms. Finally, architects who work on single-family residential buildings are a little less likely to participate in CE than their colleagues who work on general commercial buildings, essential services buildings, or those who work on a variety of building types. Beyond these factors, there is little to distinguish architects who participate in CE from those who do not.

Table 7

Participation in Continuing Education by Reason for Participation

Participated?

Total Responses
742*



Yes
72.6% (539)

No
see below

Primary Reason Participated		
Further professional development	36.7%	(187)
Keep current	30.1%	(153)
Meet AIA member requirements	28.1%	(143)
Other reason	3.5%	(18)
Meet licensing requirement	1.2%	(6)
Network	0.4%	(2)
Total	100.0%	(509)

No
27.4% (203)

Primary Reason Not Participated		
Not AIA member	28.7%	(52)
Other reason	23.2%	(42)
Not necessary for professional development	13.8%	(25)
Too much time	11.6%	(21)
Not needed for CA requirements	8.3%	(15)
Not needed to keep current	7.8%	(14)
Too expensive	6.6%	(12)
Total	100.0%	(181)

** Excludes 361 "missing cases"*

Effectiveness of Existing Programs

The remaining questions in Section 4 were designed to survey California architects regarding existing CE programs. A series of descriptive and bi-variate analyses were conducted, the results of which are presented in Tables 8 and 9.

Table 8 presents results from the respondents' general evaluation of existing CE programs. Nearly two-thirds of architects indicated that they were either satisfied or very satisfied with currently available CE. Of the others, less than 10% were very dissatisfied.

In relation to aspects of current CE programs that respondents believed were being addressed effectively, construction materials received the highest frequency of responses, followed by code/regulatory information. Computer technology, building techniques, and business management[5] were each indicated as being addressed effectively by about one-fourth of respondents. When asked for which aspects of practice additional types of CE should be offered, building techniques and code/regulatory information received the highest frequency of responses, followed by business management, computer technology, and construction materials. About one in nine respondents indicated "none needed."

Concerning the number of hours of CE per year appropriate for an architect to complete, most respondents checked either 6-10 hours, 11-15 hours, or 16-20 hours a year. Relatively few thought that more than 20 hours a year was appropriate. And in relation to the time frame within which to expect an architect to complete his or her CE requirements, almost two-thirds of the respondents thought that either one year or two years was appropriate.

Finally, on the issue of an appropriate cost for an architect to pay for CE per year, almost half of respondents checked $1.00-200.00, while one in three checked the $201.00-500.00

[5] It is worth noting that business management was also one of the two areas identified as a solution in relation to improving the performance of architects.

category. While a notable one-in-six thought the cost should be zero, only one-in-twenty felt that a cost over $500.00 per year was appropriate.

Table 8
Respondents' Evaluation of Current Continuing Education Programs

Satisfaction with Current Continuing Education

Very Satisfied	*Satisfied*	*Dissatisfied*
10.1%	54.6%	26.9%

Very Dissatisfied	*(Number)*
8.4%	(583)

Effective Aspects of Current Continuing Education (Mark all that apply.)

Construction Materials/Product Manufacturer Info.	*Code/Regulatory. Information*	*Building Techniques/ Const. Methods*
42.4 %	35.9%	24.5 %

Business Mgmt./ Contract and Legal Reqs.	*Computer Technology/ Applications*	*(Number)*
24.0 %	26.7%	(1,103)

Want More Aspects of Continuing Education Offered (Mark all that apply.)

Construction Materials/Product Manufacturer Info.	*Code/Regulatory Information*	*Building Techniques/ Const. Methods*
17.4%	31.6%	32.2%

Business Mgmt./ Contract and Legal Reqs.	*Computer Technology/ Applications*	*None Needed*	*(Number)*
24.8%	18.9%	11.8%	(1,103)

Hours of Continuing Education Appropriate Per Year

0 hrs.	*1 – 5 hrs.*	*6 – 10 hrs.*	*11 – 15 hrs.*
12.3%	9.9%	21.7%	16.0%

16 – 20 hrs.	*21 – 25 hrs.*	*> 25 hrs.*	*(Number)*
24.4%	7.3%	8.4%	(738)

Appropriate Cost of Continuing Education Per Year

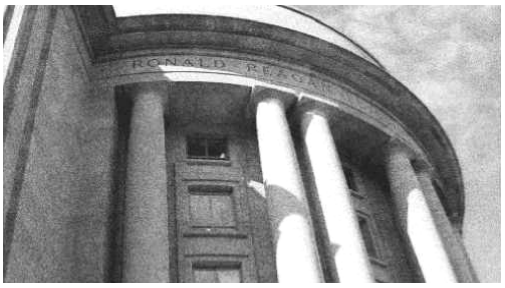
$0	*$1 – 200*	*$201 – 500*
17.0%	46.1%	30.5%

$501 - 1,000	*>$1,000*	*(Number)*
5.5%	0.8%	(740)

Appropriate Time to Complete Continuing Education Requirements

One Year	*Two Years*	*Three Years*
25.0%	39.3%	17.7%

Other	*(Number)*
18.0%	(733)



The final step in the study involved an analysis of responses to questions about respondents' participation in and opinions about different types of CE. For each of 13 types of CE, respondents provided information on the following: the outcome of their participation, in terms of its impact on their professional skills; the estimated average cost per hour; and the effectiveness of the CE for addressing the health, safety, and welfare concerns of practice. Table 9 presents a statistical summary of the main results of an analysis of these data.

Overall, of the 13 types of CE listed, vendor product seminars received the highest participation, and formal classes in architecture received the lowest. Only three types of CE – vendor product seminars, technical seminars, and independent research/self study – each received participation by more than

half of the respondents. Building code seminars received participation by almost half of the respondents. For most (eight) types of CE listed, the participation rate reported by respondents was in the one in five to one in three range.

In terms of improving the practice of architects, all 13 types of CE appeared to be seen as effective in terms of practice outcome. More than half of the respondents indicated each type as either having improved their knowledge, skills, or abilities or changed how they practiced as an architect. The highest rated CE types were independent research/self study, technical seminars, building code seminars, firm-sponsored programs, business management seminars, and home study/ distance learning. The lowest rated types of CE were professional focus groups/committees and home tours.

Costs of Professional Development

In terms of the estimated average cost, the most expensive types of CE (data not shown) appear to be business management seminars, formal classes in architecture, building code seminars, and technical seminars, in that these types were reported by a majority of respondents to cost more than $20.00 an hour on average. The least expensive types of CE appear to be vendor product seminars, independent research/self study, home tours, and community service, in that these programs had three-quarters or more of the respondents reporting that they paid $20.00 or less an hour.

In relation to their effectiveness in terms of addressing health, safety, and welfare concerns in practice, two types of CE – building code seminars and technical seminars – received the highest frequency for a rating of effective. Independent research/self study came next, followed by vendor product seminars. Five types of programs were rated together in the middle frequency for being effective: formal classes in architecture, home study/distance learning, educational programs/conference presentations, firm-sponsored programs, and professional focus groups/committees. Least effective were home tours and "other" types.

While there are many ways of determining and evaluating the overall effectiveness of these 13 types of CE, a simple procedure is to take the percent in each of the four cells reading across the four columns in Table 9 and compute an average. The result, an overall index of effectiveness (expressed as a mean percent), is given in the fifth column of the table on the far right-hand side. Using this index, three types of CE stand out with the highest mean rating. Listed in descending order, they are independent research/self study, technical seminars, and vendor product seminars. The lowest overall rated CE programs using this index are "other" types of CE, business management seminars, and formal classes in architecture.

Table 9

Type of Continuing Education by Participation Outcomes, Cost per Hour, and Effectiveness per Health, Safety, and Welfare (HSW)

Type of Continuing Education	Participated – "yes" % (N/total N)*	Improved KSA** or Changed Practice Outcome % (N/total N)	Average Cost per Hour > $20 % (N/total N)	Effective per HSW % (N/total N)	Mean Rating***
Technical Seminars	76.9% (429/558)	91.9% (388/422)	44.5% (186/418)	89.3% (651/729)	**75.7%**
Business Management Seminars	32.1% (161/501)	86.8% (144/166)	23.5% (38/162)	30.3% (212/700)	**43.2%**
Building Code Seminars	45.7% (236/516)	90.3% (223/247)	59.1% (97/237)	89.6% (645/720)	**66.6%**
Vendor Product Seminars	81.0% (442/546)	75.6% (323/427)	84.5% (360/426)	58.3% (420/720)	**74.9%**
Firm-Sponsored Programs	38.3% (193/504)	87.2% (164/188)	64.6% (113/175)	47.2% (332/704)	**59.3%**

Type of Continuing Education	Participated – "yes" % (N/total N)*	Improved KSA** or Changed Practice Outcome % (N/total N)	Average Cost per Hour > $20 % (N/total N)	Effective per HSW % (N/total N)	Mean Rating***
Formal Classes in Architecture	4.8% (23/482)	77.4% (24/31)	35.5% (11/31)	49.7% (348/700)	**41.9%**
Home Study/ Distance Learning	20.6% (101/490)	84.5% (87/103)	73.1% (76/104)	49.4% (344/697)	**56.9%**
Community Service	32.7% (166/507)	71.1% (118/166)	74.7% (112/150)	38.7% (273/705)	**54.3%**
Professional Focus Groups/ Committees	24.2% (120/496)	66.1% (78/118)	69.8% (81/116)	43.4% (304/700)	**50.9%**
Educational Program/ Conference Presentations	26.2% (131/501)	78.8% (108/137)	55.9% (71/127)	47.7% (332/696)	**52.2%**
Independent Research/ Self-Study	72.3% (387/535)	98.6% (363/368)	77.4% (284/367)	76.0% (542/713)	**81.1%**
Home Tours	36.2% (180/497)	62.2% (110/177)	75.3% (134/178)	16.3% (114/700)	**47.5%**
Other	22.9% (99/433)	84.0% (84/100)	64.3% (63/98)	12.7% (166/518)	**46.0%**

* *Count in parenthesis excludes missing cases*

** *KSA = Knowledge, skill, and abilities*

*** *Mean rating is the average across the four columns.*

MAJOR FINDINGS

The following is a summary of the major findings from the professional development study:

1. In relation to participation in CE, almost three-quarters of respondents participate and gave their primary reason as either to further professional development, to keep current with changes affecting professional practice, or to meet AIA requirements. Non-participants mostly checked not a member of AIA or other reason to explain their lack of involvement in CE.
2. The results of an analysis of participation in CE found few characteristics that distinguish participants from non-participants.
3. In relation to the effectiveness of CE programs, almost two-thirds of the architects indicated that they were either satisfied or very satisfied with currently available CE. Construction materials, code/regulatory information, computer technology, building techniques, and business management were the aspects of CE programs respondents felt were being addressed effectively. Building techniques, code/regulatory information, and business management were the additional types of CE respondents wanted offered. Most respondents checked a range between 6-20 hours as the number of hours of CE appropriate for an architect to complete per year; most thought that one or two years was an appropriate time to complete the CE requirements; and almost half checked the $100-200 category as an appropriate cost for an architect to pay for CE per year.
4. An analysis of the degree to which the level of satisfaction with existing CE programs is associated with the biographical characteristics of architects found no striking or consistent pattern of results.

5. An analysis of the architects' evaluation of the effectiveness of the 13 types of CE found that independent research/self study, technical seminars, and vendor seminars were rated highest, overall, and that "other" types of CE, business management seminars, and formal classes in architecture were rated lowest.

6. Results of a qualitative analysis to the question regarding alternatives to accomplish the ongoing learning required to remain current in architectural practice revealed the following findings:

   - Many architects believe they achieve sufficient continuing education in their profession through their day-to-day practice and self-directed efforts.
   - Architects who oppose mandatory continuing education by CAB wrote in their opinion much more frequently than those who support such requirements.
   - Architects believe some available continuing education offerings lack value and cost too much money.
   - Architects are attaining much of what they need in terms of continuing education via existing offerings and programs.
   - Architects desire additional alternative delivery methods of continuing education; frequently recorded comments suggest the need for more offerings via the Internet, videotapes, field visits, peer mentoring and firm-to-firm communication, publications from CAB, round-table discussions with stakeholders, and home study materials.

- Architects desire additional subject matter in continuing education offerings, including business and marketing skills; seminars on current legislation affecting the practice of architecture; aesthetic design and its relation to culture, community, and spiritual enrichment; environmental concerns, including eco-friendly building materials and recycled products, etc.
- Architects want alternatives to continuing education professional development opportunities.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Based on the results of the analyses of all the data gathered in this research, PMES concluded that a number of primary findings can be stated. From the post-licensure competency study, there are two major findings:

- First, the hypothesis of a post-licensure competency problem does **not** appear to be supported by the data gathered and analyzed in this research. More specifically, there is little evidence of a post-licensure proficiency problem among California architects that would result in either of the following:
  - serious problems that could have major cost, schedule, or functional impacts, OR public safety impacts
  - significant problems that could have moderate cost, schedule, or functional impacts
- Second, there is evidence suggesting that certain areas of practice may be in need of improved performance by architects in California.

From the professional development study, concerning data from the architect respondents alone, PMES concluded that there are four primary major findings:

1. Most architects participate in continuing education programs and do so either to further their professional development, to keep current with changes in practice, or to meet the requirements of AIA membership.
2. Most architects are generally satisfied with the types of continuing education currently available, and rated independent research/self study, technical seminars, and vendor seminars the highest over all, and rated "other" types of continuing education, business management seminars, and formal classes in architecture the lowest.
3. In response to Question 11 concerning alternative ways to remain current in architectural practice, many architects made specific suggestions for improving or broadening the avenues by which they can meet continuing education requirements.
4. A large number of architects voiced concern or negative opinions about mandatory continuing education. This is a strong, significant finding because respondents were not asked a direct question about this issue in the survey.

A Note on Limitations

While every reasonable research effort has been taken to ensure the validity and reliability of the data gathered in this study, the reader is cautioned to bear the following limitations in mind when interpreting the study's findings. First, the study uses a survey research methodology, which means that the data are based on perceptions and opinions and may not necessarily represent the actual behavior of architects. Second, the results are based on a relatively small sample of usable returns from the survey population. This necessitated extra precautions in both the statistical analysis and qualitative analysis to determine the degree to which the usable sample appears representative and that the data have scientific integrity within technically acceptable bounds of measurement and sampling

error. Even so, all available evidence suggests that the study, in terms of research design, methods, and analysis procedures, is scientifically sound and that the results are valid and reliable.

RECOMMENDATIONS

On the basis of the study results, PMES made the following recommendations to the Board:

1. It does not appear that the need for a strong, immediate intervention by the Board on post-licensure proficiency is required at this time.
2. It does not appear that there is any basis for Board action to implement mandatory continuing education to address architect proficiency.
3. Because the data suggest that there are areas of practice that can be viewed as needing improvement, it is recommended that the Board determine whether there is a need for further professional development in these areas of practice.
4. It is also recommended that the Board use the results of this study to inform those who believe that architect proficiency in California is problematic.
5. Notwithstanding the above recommendations, it is further recommended that the Board use these results to inform architects and other interested parties (in particular their associated professionals and the public) of how well, in general, architects in California perform their practice.

BOARD ACTION

The Task Force on Post-Licensure Competency met on June 13, 2001 to review and discuss the survey results in detail. The Task Force made the following recommendations that the Board approved at its June 14, 2001 meeting.

- *To accept the report on the results of the California Architect Proficiency Survey as prepared by PMES and to agree with the conclusions and recommendations contained therein that, on an overall basis, there is not a significant proficiency problem that would warrant mandatory continuing education at this time.*
- *To take the following courses of action in relation to the survey results:*
  1. *Publish the results and send them to interested parties for their information.*
  2. *Recommend that The American Institute of Architects, California Council (AIACC), National Council of Architectural Registration Boards (NCARB), California Building Officials (CALBO), etc. create monographs, courses, etc. on the areas that received ratings in the "less than proficient" range.*
  3. *Write articles in the Board's newsletter.*
- *Create an implementation subgroup or task force to implement the above courses of action and continue work in relation to the survey results.*

- *Have the implementation subgroup or task force use the chart contained in Figure 3 (pages 58-59) of PMES' report on the California Architect Proficiency Survey to prioritize areas they will address. Have them use a selection guideline of three or more stakeholder groups that rated a particular area below 3-Mostly Proficient and include code issues that span multiple areas.*
- *Provide PMES' report on the California Architect Proficiency Survey to CAB's Professional Qualifications Committee, Regulatory and Enforcement Committee, and other CAB committees for their review and possible identification of areas that may fall under their purview.*